

FROM SUBDUCTION TO TRANSFORM MOTION :  
A SEABEAM SURVEY OF THE HELLENIC TRENCH SYSTEM

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RESUME

Un récent relevé bathymétrique détaillé dans les fosses helléniques a été effectué par le N.O. J. Charcot à l'aide d'un sondeur multi-faisceau (Rayon de Mer). La figure 1 indique la localisation des quatre secteurs étudiés en détail. Confirmant une interprétation plus générale du système hellénique (+), ces relevés suggèrent que dans les fosses ioniennes (NW-SE) la subduction est frontale, alors que dans les fosses de Strabo et de Pline (NE-SW) le mouvement est principalement transformant. La présence de pentes très raides et de canyons et les indices de tectonique active sont des éléments très favorables à une campagne d'exploration en submersible (Programme HEAT).

We report here the preliminary results of a bathymetric survey of the Hellenic trench system in the Eastern Mediterranean, using a multi-narrow beam sounder, the Seabeam, installed on board R.V. Jean Charcot in 1977. This is, to our knowledge, the first multi-narrow beam survey of a subduction zone available to the scientific community. The much higher resolution obtained in this type of survey, compared to the standard wide-beam or even to the single narrow-beam surveys, has revealed the detailed structural pattern within the trench itself. The pattern in the southwestern branch (the Hellenic trench) is drastically different from the one in the southeastern one (the Pliny and Strabo trenches, see figure 1). The former is dominated by convergent motion (subduction) while the latter are dominated by transform motion.

Figure 1 schematically shows the trench system and the locations of the four zones which have been mapped during the HEAT cruise of R.V. Jean Charcot in September 1978. The corresponding maps were established on board at a scale of 1/20 000th. The arrows on fig.1 are the average slip vectors of the Mediterranean sea-floor with respect to the Hellenic arc (+).

We conclude that the Hellenic trench system is an active subduction system, dominated by frontal subduction (thrust) along the Ionian branch (NW-SE) of the Hellenic trenches and by transform motion along the Pliny and Strabo branch (NE-SW). The main characteristic of the Ionian branch is the division in small basins, partly filled with Pleistocene sediments, which are being deformed by a compressional stress perpendicular to the trench and, as a result, probably have a geologically short life. The Pliny and Strabo branch is dominated by transform motion, which can be clearly analyzed because of the absence of Pleistocene sediment fill. The presence of very steep slopes, active canyons and active tectonics suggests that a submersible geological mapping program should be successful there (HEAT program : Hellenic Arc and Trench System).

(+) X. Le Pichon and J. Angelier, The Hellenic Arc and Trench system : a key to the neotectonic evolution of the Eastern Mediterranean area, *Tectonophysics*, sous presse. See also the abstract in the Same Committee : The Hellenic arc, a key to the kinematics of the eastern mediterranean since 13 millions years.

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*From subduction to transform motion : a seabeam survey of the Hellenic trench system (X. Le Pichon et al.)*

FIGURE 1

